APPARATUS FOR CONVERTING ELECTRIC SIGNALS REPRESENTING DATA INTO A GROUP OF RAISED DOTS CONSTITUTING THE IMAGE OF SAID DATA

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an apparatus for converting electric signals representing data into a coded image of said data comprising a group of raised points or dots. More particularly, though not exclusively, such apparatus finds application in terminal units in which the numerical electric signals emitted by a data processor are converted into groups or raised dots disposed in such a way as to constitute the image of raised symbols intended either to be recorded on a paper tape, or to be identified by touch by running the fingers of one's hand along said symbols. The apparatus is well suited for comprising Braille characters.

2. Description of the Prior Art

Conversion devices are known in the art such as those described and illustrated, for example, in French Pat. Nos. 844,075 and 2,408,879 corresponding to U.S. Pat. No. 4,194,190. Such devices have one or more modules comprising a certain number of tactile pins mounted to slide within a guide block provided with a surface for reading. Each of the pins is capable of moving prependicularly to the reading surface and is fixed such as to take either a raised position in which one of the extremities of the pin juts out from the reading surface, or a retracted position in which the extremity of the pin remains in the guide block and thus does not exceed or jut out from the reading surface.

In a specific embodiment of the invention which as been described in the aforementioned French Pat. No. 2,408,879, corresponding to U.S. Pat. No. 4,194,190 each module has, preferably, six tactile pins which can be placed in a raised position by means of six electromagnets. Each electromagnet is associated with one each of the six pins, the electromagnets are capable of being excited selectively by groups of electric signals emitted by the data processor, the signals of each group being arranged in accordance with a code representing a writing symbol. The tactile pins which have been brought in a raised position in response to the application of a group of signals on said electromagnets, then form on the reading surface a group of raised dots whose arrangement is characteristic of the symbol represented, in coded form, by the group of signals. The configuration presented by this group of raised dots enables one who is blind or has a poor eyesight, but who has learned to recognize the different dot configurations to identify the symbol corresponding to said configuration simply by running his or her fingers along on the reading surface. Nevertheless, in view of the fact that, on the one hand, the higher the number of symbols that can thus be represented, the greater the number of tactile pins needed to represent a symbol and, on the other hand to represent the symbols of the same line of text, it is necessary to have at one's disposal a number of modules at least equal to that of the symbols constituting said lines, the conversion devices of this type usually have a very large number of tactile pins which, in order to be able to function properly, must be adjusted with a high degree of precision in the guide blocks. As a result, the fabrication of this type of conversion device has proved to be both complicated and costly. Furthermore, the tactile pins, which are relatively small in size, are fragile and deteriorate very rapidly despite greasing operations to which they are subjected at regular intervals. Finally, the replacement of worn parts always raises problems, especially because of the small size of these parts and the short distances from which they are separated from each other.

Magnetic printers are known in the art that have a magnetic recording medium provided with a surface capable of being magnetized locally at elementary sites of very small dimensions disposed in rows and columns. The size of these sites never exceeds 250 microns. These machines also have a recording unit disposed near the surface of the recording medium and provided in order, in response to the reception of electric signals to selectively magnetize these sites. A suitable drive is provided to bring about a relative displacement between the recording medium and the recording unit, according to a predetermined direction of movement in order to enable these elementary sites to be selectively magnetized in the course of their movement past the recording unit.

Such printers also have an applicator means which, fitted downstream of the recording unit in relation to the direction of movement, enables particles of a developer to be deposited on the recording medium. These particles, which are magnetically attractable, only subsist on the elementary sites of the medium that have been magnetized, forming a powder image that is then transferred to a sheet of paper. In a variation that has been described in French patent application Ser. No. 2,449,911, corresponding to U.S. Pat. No. 4,321,606, the powder image that has thus been formed is not transferred to a sheet of paper but, constitutes raised characters on the surface of the recording medium. The raised characters, when urged against a sheet of paper, cause the image to be printed on the sheet, the inking being obtained by means of a carbon paper tape inserted between the sheet and the characters.

In order to achieve an average quality of printing, the grains that have been used in this technique for forming raised characters must have size equal to 250 microns. Furthermore, these grains must be coarse in order not to slip on the medium or on the sheet against which they are urged. Finally, in order for these grains to withstand the crushing action exerted thereon during their passage, they must be very hard. In view of these conditions, this technique of forming raised characters cannot be applied to the formation of characters intended to be recognized by touch. Indeed, the developer grains, due to their coarseness, would oppose the sliding of the fingers. In addition, their size, which differs from one grain to another, would not permit the creation on the surface of the recording medium of a uniform or well-marked relief for each character or symbol necessary for recognition by touch of that character or symbol, the relief being at least of the order of 0.5 millimeters. Finally, even if their size were increased, because these grains would be difficult to recognize, this would cause a great fatigue for the person doing the identification of the characters. There also could result scratches on the surface of the recording medium rapidly rendering the latter inoperative.

SUMMARY OF THE INVENTION

The present invention overcomes these drawbacks and proposes an apparatus that enables electric signals to be converted into groups of raised dots, and which is